Article by Frederick W. Baldwin, December 2, 1909

333 Canadian Aerodrome Company ON THE ADVANTAGES OF FLYING HIGH IN AN AERODROME By. F.W. Baldwin

Dec. 2, 1909 :— The speed of a motor car is not judged by its performance on low gear. It is equally absurd to judge the speed of flying machine by its performance at low elevations. An aerodrome flying near the ground is in exactly the same condition as a motor car on low gear.

A brief consideration of the laws of resistance shows that the flying machines of the present are capable of much greater speed at higher elevations, i.e. in a more rarified atmosphere.

The resistance a body meets with in a fluid is proportional to the mass of the f luid, and the square of its velocity. If the density is reduced to one-half, the resistance offered to a body moving through it, is correspondingly reduced.

The full meaning of this law is of the greatest importance to heavier-than-air flight. It means that, at an elevation of about 16,000 feet, a flying machine will double its speed, with the same power.

Suppose that a machine rises to 16,000 feet. The density of the air at that height being about one-half of what it is at the ground, the propeller would meet with one-half the resistance; and the same power would be capable of giving it twice the speed of rotation: But, at twice the speed of rotation, the propeller would give the same thrust as near the ground.

Similarly the machine would meet with only one-half of the resistance; so that, with the same thrust, it would be 2 driven twice as fast; and, at twice the speed, the aero-surfaces would still support the machine.

The nett result of reducing the density, would be an increase in the speed of the machine directly proportional to the decrease of the density of the air.

All that is necessary to accomplish this result in practice is to provide the machine with a gear-shifting arrangement, which would allow the propeller to turn over at different speeds while the engine preserved the same speed.

The mechanical difficulty has been solved for us by the motor car; and all that an aerodrome needs to be adapted to take advantage of the principle of high flying, is the well-tried gear-shifting arrangement in common use on motor cars.

It is important for the flying machine to be able to leave the ground, and alight, at moderate speeds; and at the same time be capable of high speeds in the air.

To accomplish this, the general idea is that a drome must be able to reef its supporting surfaces. The mechanical difficulties presented by this method will not be easily overcome; whereas, if we can adapt the propeller for the changed conditions at higher elevations, nature offers the simplest, and most reasonable solution of the problem, and reefing will be unnecessary.

One difficulty, which at first thought presents itself, is that of breathing the rarified air. If, however, we consider that the increased speed of the machine preserves a constant pressure, it is plain that this offers no difficulties.

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A general impression prevails that heavier-than-air machines are especially suited for low elevations, and that the dirigible balloon will be the high flyer; whereas it is just the reverse.

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A dirigible balloon which depends upon the principle of displacement for support, is limited in the elevations at which it can operate; whereas a heavier-than-air machine is theoretically unlimited in the matter of elevation; and the higher, the faster.

In support of the theory of higher speed at reduced atmospheric pressure, we have the now favorably established comparison of an aerial propeller with a water propeller. About 1880 Vogt made experiments with aerial propellers and demonstrated that the efficiency was equal to that of water propellers.

Since that time we have had ample proof of the truth of this. Aerial propellers are today giving substantially as good results as water propellers. If then a propeller can work as well in a medium about 800 times lighter, it is almost certain that a further reduction will comply with the rule.

If a heavier-than-air machine can fly at all at high elevations, surely it must be travelling at higher speed. surely it must be traveling at higher speed. How else could it be supported? FWB